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Born To Live — But How Long?

Medical science and public health have made such noteworthy strides in deferring death since the 18th century that it comes as a shock to learn from a recent United Nations' report that of nearly 100 million babies born in the world every year, at least 12 million and possibly 20 million die before their first birthday.

The timing of death is very different in different parts of the world. In western countries where health and welfare standards are high both infant death rates and general death rates are low. Fewer than two percent of all babies born in Sweden in 1954 died during their first year; barely three percent will fail to live to adulthood.

In the economically underdeveloped countries, where health standards and living levels are low, infant death rates are up to ten times higher. Death rates in other age groups also remain high. In India in 1952, some 12 percent of all babies born died during their first year; more than 50 percent will die before reaching adulthood.

Infant mortality in high death rate countries could be sharply reduced by modern medicine and public health programs. Any improvements in sanitation, welfare, and health, especially in the control of infectious and nutritional diseases, are quickly reflected in lower infant death rates.

The first day of life, first week and first year remain the most hazardous day, week and year the average person will face before reaching three score and ten. Greatest gains in reducing infant deaths have been made for infants between the end of the first week and the first year; least gains for infants under one week.

In low death rate countries of the west, infant deaths become progressively less preventable because a large share of deaths in the first week are caused by congenital defects and deficiencies, either hereditary or accidental, premature births and injuries at birth.

A baby's chance of survival is conditioned by many biological factors: sex, age of mother, number of children previously born to her, time interval between her pregnancies, multiple births and premature births before the end of the normal gestation period.

Economic factors which affect infant death rates include living levels as measured by food supply, illiteracy and per capita national income. Lowest income groups the world over have highest infant death rates.

The number of births over deaths determines the rate of a country's

population growth. In the past, very high birth rates were essential to make up for the frightful wastage of young lives such as is still found in some underdeveloped areas not yet touched by modern medicine and public health.

It may seem paradoxical, but a dramatic decline in infant and childhood mortality can now threaten the economic future of many agrarian countries. Discussing this problem, the United Nations' report points out the danger that a sharp reduction in infant deaths in those very countries with highest infant mortality will lead to rapid population growth and could create even more poverty for far greater numbers of people unless birth rates are also lowered.[1]

INFANT MORTALITY A GOOD YARDSTICK

Infant mortality is one of the best yardsticks for measuring the social well-being of a nation. Unlike the crude death rate, it is not affected by the age structure of the population. Infant mortality is measured by the number of deaths under one year per thousand children born alive; crude death rates are based on the total number of deaths per thousand of the population of all ages.

Infant death rates are affected by errors in registration of births and deaths, so it is impossible to determine the exact number of infant deaths throughout the world. In countries where registration is incomplete, deaths of infants and young children are less likely to be reported than those of older people.

Statistics on causes of death at different ages are inadequate in all but a few countries. In India and many other countries, incomplete registration means that actual mortality is seriously understated. Even in the countries with modern statistical services, registration of causes of death is rarely complete because of poor diagnosis and inadequate reporting.

DIFFERENCES BETWEEN COUNTRIES AND WITHIN REGIONS

Today more than one-half of the world's people live in high death rate areas. It has been estimated that in those areas, current rates of infant and early childhood mortality reduce the average length of life by 10 to 20 years.

For example, Ceylon's 1920-22 male life table indicates that the expectation of life at birth was almost 33 years and that the expectation for those children who had survived the first five hazardous years of life was slightly over 43 years. If no child under 5 had died, the complete expectation of life at birth would have been increased by slightly more than 15 years. The corresponding figure for males in India, based on the 1941-50 life table, is a little over 13 years.[2]

Generally speaking, high infant death rates prevail in those areas now generally referred to as economically underdeveloped: Africa, Asia, and Latin America. In recent years, lowest infant death rates are found in northwestern Europe and in those other part

of the world settled by northwest Europeans.

Large variations in infant mortality are often found within regions. Because 1954 rates are available for only a few countries, up-to-the-minute comparisons are not possible. In Latin America, 1953 rates ranged from a high of 114* in Chile to lows of 53 in Panama and 65 in Argentina.

Asia has similar contrasts, though only sparse statistical data are available for most recent years. In 1953, the Jewish population of Israel and the Japanese recorded lowest infant mortality rates, 36 and 48 respectively. If reliable data were available, the rates of other Asian countries would be very high. India's last recorded rate (1952) was 116.

Some western European countries have the world's lowest infant mortality rates: in 1954, Sweden's rate was only 18, the Netherlands' was 21, and the United Kingdom's was 26. Comparatively high rates

*Infant mortality rates show the number of babies dying under one year of age per 1000 babies born alive.

TABLE I: AVERAGE MORTALITY RATES AND PERCENTAGES OF INFANT AND TOTAL DEATHS BY COUNTRY, 1936-45 AND 1946-53[3]

(Per 1000 Live Births)

Country	Period	Deaths Under One Year Rate	Deaths Under One Month Rate	Deaths Under One Month Percent of Total Infant Deaths
Australia[1]	1936-45	36.7	24.9	67.7
	1946-52	26.2	18.6	71.1
Canada	1936-45	58.9	30.4	51.6
	1946-52	42.2	24.6	58.4
Chile	1936-45	211.3	90.7	42.9
	1946-53	154.8	57.7	37.3
England & Wales	1936-45	52.3	27.5	52.6
	1946-52	34.4	20.4	59.5
France	1936-45	75.9	27.2	35.9
	1946-52	57.1	27.0	46.4
India	1936-42	160.8	75.1	46.7
	1946-49	133.7	60.4[2]	45.6[2]
Ireland	1936-45	72.4	30.2	41.7
	1946-52	53.0	25.3	47.8
Italy	1936-42	105.9	38.1	36.0
	1946-52	73.6	32.6	44.3
Japan	1936-42	100.3	41.4	41.3
	1947-52	62.0	28.5	45.9
Mexico	1936-45	121.2	41.1	33.9
	1946-52	101.0	34.9	34.5
Portugal	1936-45	132.4	—	—
	1946-52	102.7	33.6	32.7
Spain	1941-45	108.6	29.7	27.4
	1946-52	73.1	23.9	32.7
Sweden	1936-45	35.7	21.4	59.9
	1946-52	23.1	16.5	71.1
United States	1936-45	45.5	27.6	60.5
	1946-52	30.7	21.5	70.0

[1]Excluding full-blooded aborigines.
[2]1947-49.

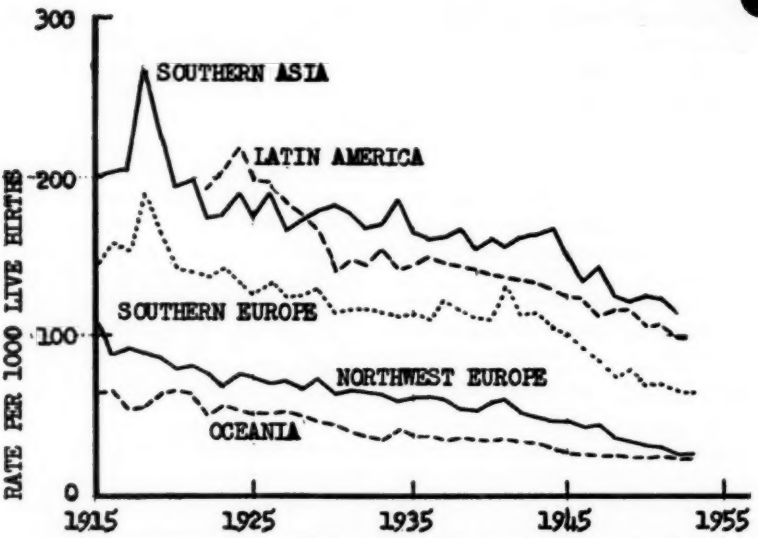

FIGURE 1: REGIONAL DIFFERENCES IN INFANT MORTALITY, 1915-1953[4]

Infant mortality has declined in all parts of the world in the last 40 years. But only a small proportion of the peoples of the earth enjoy the low rate characteristic of Northwest Europe, the United States, Australia and New Zealand.

were found that year in West Germany and France, with 43 and 37 respectively.

The United States' rate was 27 in 1954.

Southern and eastern Europe generally have intermediate infant mortality rates. In 1954, Yugoslavia with 102 had the highest; Italy with 53 and Spain with 52 had the lowest. Czechoslovakia reported 73 in 1951.[5]

CAUSES OF INFANT DEATHS DIFFER FROM AREA TO AREA

Few underdeveloped nations have yet felt the impact of modern medicine and public health. Preventable diseases not yet controlled cause most infant deaths. Miserable living conditions are also reflected in the high proportion of infant deaths occurring between the beginning of the second month and the end of the twelfth: 85 percent of infant deaths in Egypt, 67 in Mexico, 64 in Chile and 55 in India in 1946. During that same year the proportion in Sweden was 32, in the United States 29 and in Australia 27.[6]

In most western countries, technology and public health, aided more recently by potent antibiotics, have combined to subdue the big killers of infants and children. Preventable diseases which cause most of the deaths after the first week have been brought under control.

In these countries the larger proportion of first-year deaths occurs

the first week and especially during the first day. These deaths are most difficult to control or defer because they result mainly from congenital defects, premature births, diseases of very early infancy and injuries at birth. For that reason there will be little if any further reduction in infant mortality until obstetrical procedures are improved or until congenital defects and premature birth are prevented and controlled.

BUILT-IN DEATHS OF EARLY INFANCY

In countries where infant mortality is low, the trend of the death rate during the first month of life is in striking contrast to that during all the remaining months up to age one. In Sweden, there was very little decline in deaths of infants under one month but considerable decline among other age groups under one year.

In 1915, 30 Swedish infants of every 1000 born alive died within the first month compared with only 18 in 1947. This decline was due mainly to fewer infants dying during the second through the fourth weeks of life: 13 in 1915, compared with only 3 in 1947. (See Figure 3)

In contrast, for children under one week, the death rate was 17 in 1915 and 16 in 1945. "The real neonatal mortality is the first week, not the first month of life.[7]"

Deaths in the last weeks of gestation and during the first day or week of life are called perinatal deaths. Most of these have a different basis from deaths occurring during the succeeding weeks of the first year of life. Some are due to the heredity of the child and others to accidents in pre-natal development.

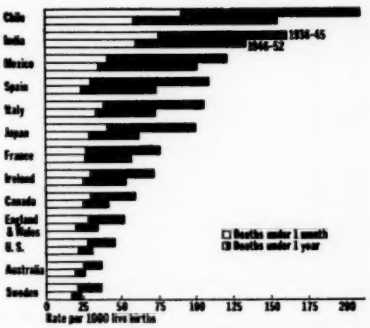

FIGURE 2: INFANT MORTALITY BY AGE FOR SELECTED COUNTRIES, 1936-45 AND 1946-53[8]

The timing of infant deaths is a remarkably accurate indicator of a country's living levels. In the agrarian countries with low income levels, the greater proportion of infant deaths occurs between the second and twelfth months. In the economically advanced countries, most infant deaths occur in the first month.

Hereditary seeds of early death may be implanted in the embryo at the time of conception, by the genes contributed by the two parents. It is a tragic paradox that a considerable number of genes, the units of heredity, have what geneticists call a recessive lethal effect. This means that when the same recessive gene is transmitted to the child from both parents, the child is fated to die at some point during gestation or shortly after birth. Many different recessive lethal genes are known today.

The genetic constitution of the mother also may affect her child's chances of survival regardless of the genetic constitution of the child. The rate of fetal and infant death is very high among women with diabetes—a disease which fre-

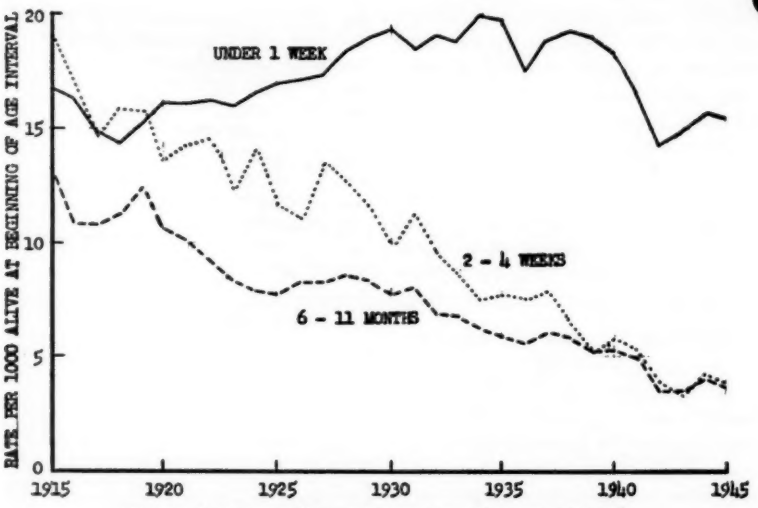

FIGURE 3: INFANT MORTALITY BY AGE, SWEDEN, 1915-45*

During the past forty years, the death rate of infants under one week of age has declined very little, while deaths in the later months have been reduced by two-thirds. The neonatal deaths (under one month) are caused by factors least amenable to control by modern medicine.

quently has a genetic basis. Before the discovery of insulin the pregnancy of diabetic women was usually fatal to the mother as well as to the child. Even with the most advanced treatment, this hazard is not altogether eliminated.

Some pre- and post-natal deaths are caused by blood incompatibilities between the mother and the child she is carrying. The so-called "Rh factor" is the most serious of these. In still other instances, certain genes produce gross malformations or malfunctions which make life impossible. The skin may not cover the entire body, or the structure of the heart may be so faulty that it cannot maintain the circulation of the blood.

The lethal genes which act before death have been studied mainly in animals. Some kill the embryo very early, while others do their deadly work at the end of gestation. Many spontaneous miscarriages and abortions are considered to be due to such genes.

OTHER BIOLOGICAL FACTORS INFLUENCE INFANT DEATHS

Other biological factors influencing infant mortality are sex of baby, age of the mother, number of children she has borne and the interval between births. Twins and other multiple births reduce survival chances of the child. So does birth before the end of the normal gestation period.

Among many mammals, including man, males generally have a higher mortality than females. More boys are born than girls—106 to 100—but the hazard of being a male begins long before birth.

The survival handicap against the male declines as gestation progresses. At birth it is about twenty percent greater for the male than for the female. Female babies appear to be profiting more than male babies from modern advances in child care.

In terms of reproductive efficiency, the mother's best years are between 20 and 35. Children born to very young mothers and to women over 35 face a measurable survival handicap as compared with babies born to women at their reproductive prime.

First-born children also have a survival handicap. The hazards are least for the second-born child. After that, the odds against survival of both mother and child rise steadily as the number of births increases, due partly to biological and partly to economic factors. With the birth of the eighth child, women and their babies enter an area of pyramiding survival risks. The risk of death in infancy is twice as great for a tenth child as for a second child.

The interval between births also appears to alter the survival odds of mother and child. Too short or too long intervals reduce reproductive efficiency. When children are born at least two years and no more than four years apart, they have the best chance of survival. This timing factor works independently of the age of the mother and of the number of children she has borne.

Multiple births—twins, triplets, etc.—greatly increase the hazards of gestation and birth for both the child and the mother. The stillbirth ratio among twin fetuses is more than twice as high as it is for a single fetus. The survival risk is greater for identical twins than for fraternal twins. Triplets, quadruplets and quintuplets have increasing handicaps during gestation and birth. An English survey revealed that when one of a set of multiple fetuses is stillborn, other fetuses of the same gestation tend to share its fate.

About six percent of all births occur before the end of the normal gestation period. These premature babies have an enormous handicap the first month of life, with a death rate in some countries 25 times that of an infant born at full term.[10]

Real progress has been made in saving the lives of premature infants in a few specialized hospitals. Preliminary reports have recently been published of a drug which prevents premature births. Such a drug widely applied would reduce infant mortality rates.

ECONOMIC FACTORS INFLUENCE INFANT MORTALITY

Different levels of economic development are reflected in the striking infant mortality differences between countries, because infant mortality varies inversely with the level of living of any country or group. Where levels are high—measured by food supply in terms

of calories, illiteracy and per capita national income—infant mortality is low. Where living levels are low, infant death rates are high.

Adequate nutrition for pregnant mothers and for babies after birth is essential for survival and development of children. Because pregnant women and infants are first to feel the impact of food shortages, infant mortality rates are high where food is scarce. The rates rise dramatically under famine conditions.

Countries where the average daily number of calories available is 3,000 or more per capita have lowest infant death rates. Highest rates are found in countries with a calorie supply of 2,500 or less.

Still another correlation exists—one between literacy and infant death rates. Rates are lowest where literacy is highest; they are highest when literacy is lowest. The mother is the immediate agent through whom social institutions must act to safeguard the health and life of the child, so her attitudes and abilities are of great importance. These are largely conditioned by the extent of her education.

Family income can be considered the common denominator. Table II shows that in countries where per capita income is high, infant mortality rates are low. In 1949, the United States had a per capita national income of $1453 and an infant death rate of only 31. India's per capita income was only $57; her reported infant death rate was 123, more than four times as high. Her actual rate was still higher.

Because of these environmental relationships, infant mortality is one of the best yardsticks for measuring the social well-being of a nation.

Within countries the world over, low income groups record high in-

TABLE II: INDICES OF LEVELS OF LIVING, BY COUNTRY[11]

Country	Deaths Under One Year per 1000 Live Births 1946-52	Daily Number of Calories Per Person Pre-War Average	Illiteracy Among Women 20-49 Years		Estimated Per Capita National Income 1949 (U.S. $)
			%	Year	
Egypt	128.6[1]	2,450	95.7	1937	100
India	133.7[2]	1,970	97.9[3]	1931	57
Chile	154.8[4]	2,240	28.2	1940	188
Mexico	101.0	—	52.7[5]	1940	121
Portugal	102.7	—	55.8	1940	250
Italy	73.6	2,510	21.0	1931	235
Japan	62.0[6]	2,180	—	—	100
France	57.1	2,880	42.5[7]	1936	482
United States	30.7	3,150	4.1	1930	1453
United Kingdom	35.8	3,100	—	—	773
Australia	26.2	3,300	—	—	679
Sweden	23.1	3,120	0.1	1930	780

[1] 1951
[2] 1946-9
[3] 20 years and over
[4] 1946-53
[5] 15-39 years
[6] 1947-52
[7] 10 years and over

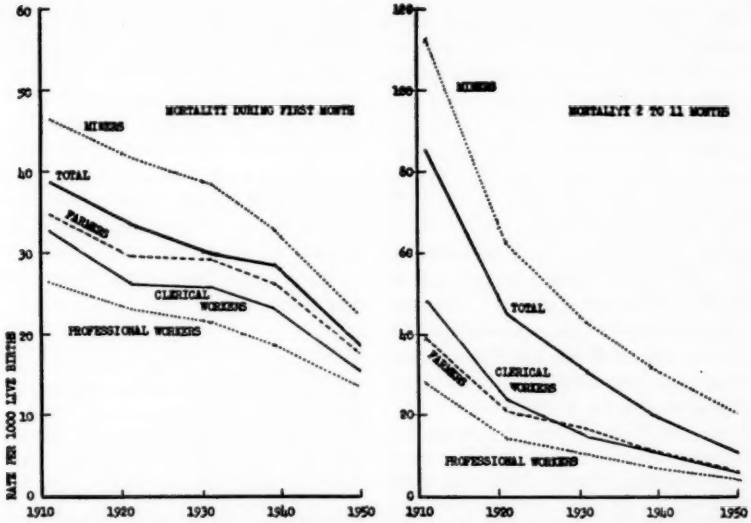

FIGURE 4: INFANT MORTALITY RELATED TO SOCIO-ECONOMIC STATUS, ENGLAND AND WALES, 1911-1950[12]

In England and Wales during a thirty-year period, infant deaths are related to occupation of father, both in the neonatal period (under one month) and during the succeeding eleven months of the first year. In both age categories, socio-economic differentials have steadily declined.

fant mortality rates. A recent study using British data analyzed infant mortality from 1911 to 1950 in terms of occupation and social class of father. A continuous decline in infant mortality for all groups was reported, but the reduction was greatest among those occupations and social classes which experienced the greatest economic improvement.

Figure 4 shows less decline in neonatal (first month) than in post-neonatal (two to eleven months) mortality between 1911 and 1950. In both types of infant mortality, declines since 1911 have brought the rates by occupation of father closer together. The greatest decline in post-neonatal mortality took place during the 1911-21 decade. The greatest decline in neonatal mortality came during the 1940's.[13]

A recent study which uses French data for 1951 shows the same inverse relationship between occupation and infant mortality: post-neonatal mortality accounts for a larger proportion of total infant deaths among the lower paid occupations than among the professional groups.[14]

LOWER INFANT MORTALITY MEANS FASTER POPULATION GROWTH

A definite majority of the world's population lives in countries which now have high infant mortality rates. There both fer-

tility and mortality are high. Population pressure is often intense and living conditions are primitive.

As modern health programs are introduced into these countries, infant death rates will fall first, and rapidly. Then mortality rates at other ages will fall. But fertility will remain high, at least for a time. Population will increase at a rapid rate. What happened in British Guiana since the close of World War II was reported by the International Bank for Reconstruction and Development, a United Nations agency, in 1953:

> Since 1945 the annual rate of growth of population has increased sharply from 1.5% to 2.8%. This is a factor of major significance for the economy, and one which, more than any other, has influenced the mission's recommendations.
>
> Before 1945 the drainage and irrigation canals of the coastal area had long furnished ideal breeding places for *Anopheles darlingi*, the malaria-carrying mosquito, and malaria was the principal cause of sickness and death. In that year a thorough campaign to spray all homes with DDT was undertaken. This, the first civilian campaign of its kind in the world, was strikingly successful, and in a very short time the *Anopheles darlingi* was virtually eliminated.
>
> The disappearance of malaria brought about a sharp fall in the death rate, which fell from an average of 19.7 per 1,000 over the period 1940-45 to 14.6 over the period 1946-51. The reduction was most marked in the lower age groups. In particular, infant mortality showed a striking decrease from 110.7 per 1,000 births in 1940-45 to 81.8 in 1946-51. Over the same interval the birth rate rose from 35.1 to 40.3[15].

The predicament of British Guiana—like that of Ceylon[16]—needs to be studied by other underdeveloped countries where birth and death rates are still high. Those two case histories demonstrate that when the new powers of medical science and public health are used to defer death in high death rate countries, all efforts to raise low living levels will be jeopardized unless birth rates also decline. More babies will be born, more will survive longer—but for what kind of a future? The United Nations' report on infant mortality recognizes the dilemma:

> Finally, a rapid reduction in reproductive wastage will result in an immediate and rapid population increase. This may seriously aggravate the population problems in at least some of the underdeveloped countries which today are the principal candidates for generous reductions in reproductive wastage. . . .
>
> The vicious circle which, according to some writers, ties together excessive fertility and high mortality with poverty can be broken by intelligent planning and the improved utilization of the material and human resources of each country. The prevention of excess fertility would then represent a double saving for the family and the community at large.[17]

Dr. Gerald Winfield, on the basis of many years experience in health work in China, goes even further. He doubts that the improvement of living conditions is possible if the reduction in death rates precedes the control of fertility:

> The ultimate purpose of the medical health service in China is not solely to treat illness and save lives, nor even to prevent disease, but to contribute to the long-range wellbeing of the entire population by bringing about a drop in the birth rate to equal the drop in the death rate, to assure the nation of fewer but healthier citizens living in greater economic security. . . . It is obvious that the first objective of the medical health program must *not* be the simple natural one of saving lives: instead, it must be the development of means whereby the Chinese people will reduce their birth rate

as rapidly as modern science can reduce the death rate. . . . The future welfare of the Chinese people is more dependent on the prevention of births than on the prevention of deaths.[18]

LET'S FACE IT

That welfare in a high death rate country can be endangered by a reduction in mortality is a grim paradox not easy for anyone with compassionate humanitarian instincts to accept. Historically, in such countries as China, high fertility has been necessary until very recently to balance universally high death rates—especially among infants. During the past century, an ever more effective control of deaths—especially in the younger years—has changed that. What was once a necessity for national survival may become in the modern world a dangerous anachronism. It is in this context that Dr. Winfield's warning must be read.

Freedom from want for all people is one of the lofty ideals of the United Nations' Charter. Now, ten years after the birth of that organization, creeping hunger and deteriorating living conditions are the lot of more than half the human race, and threaten millions more, mainly because of rapid population growth. Attempts to relieve population pressure by increasing production of food and goods have been tried. Obviously, this of itself cannot long be enough.

—ROBERT C. COOK, *Editor*

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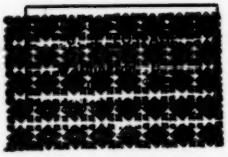
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